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Scholastic factors pertaining to the academic achievement of Nigerian students in the United States

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SCHOLASTIC FACTORS PERTAINING TO THE ACADEMIC ACHIEVEMENT OF NIGERIAN STUDENTS IN THE UNITED STATES

by

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THE PROBLEM

Introduction

Through their graduates, colleges and universities in the United States are exerting appreciable influence in the affairs of the Federal Republic of Nigeria. At the time of the overthrow of the constitutionally elected government in January, 1966, both the President of the country and the President of the Nigerian Senate were graduates of institutions of higher learning in the United States. In addition, some members of the federal cabinet and other persons occupying key positions in education, government and industry were alumni of colleges and universities in the United States. Perhaps the influence referred to above was, at least in part, responsible for the fact that three of the nine members of the "Ashby Commission" (34), which in 1959 reviewed post-school certificate education for Nigeria were scholars from the United States.

Moreover, in recent years, many Nigerians have continued their formal education in the United States. For instance, figures released by the Education Division of the Consulate General of Nigeria in New York City showed that in 1963-64 there were 1,140 Nigerian students in 250 colleges and universities in the United States. During the same period, there were 5,058 students in the five Nigerian universities. By 1966-67 the number of Nigerian students in the United States had climbed to 1,882.

Statement of Problem

Simply stated, the problem is to survey the Nigerian students now in institutions of higher learning in the United States and try to determine

some of the factors that have been associated with their academic achievement.

The first question of interest is the prediction of the probability of success prior to the student enrolling in an institution of higher education in the United States. What measure or measures will furnish a satisfactory degree of accuracy with minimum amount of labor? What role, if any, do entrance characteristics play? Can prediction be made accurately just after a student's first term in residence?

A second issue of interest is the advantage to a Nigerian graduate student in a graduate college in the United States of earning his first degree in the United States. This may be investigated using the null hypothesis: there is no difference between the academic achievement of graduate students who earned their first degrees in the United States and those who were awarded first degrees elsewhere.

Finally, with the undergraduate students separated into two groups, scholarship and nonscholarship, are there any significant differences between these groups? What, if any, conclusions may be drawn from any appreciable differences? This shall be investigated using the null hypothesis: there is no difference between the academic achievement of the scholarship and nonscholarship Nigerian undergraduates.

The following null hypotheses are involved in this study:

1. There is no difference between the academic achievement of Nigerian graduate students who earned their first degrees in the United States and those who were awarded first degrees elsewhere.

2. There is no difference between the academic achievement of scholarship and nonscholarship Nigerian undergraduates.

3. There is no difference in the academic achievement of Nigerian undergraduates who completed the equivalent of the higher school certificate examination and those who completed the equivalent of the ordinary high school.

Purpose of the Study

Since independence in 1960, many students have received financial aid from the various governments of the Federal Republic of Nigeria to continue their formal education in the United States. In addition, the Government of the United States, through the United States Agency for International Development (U.S.A.I.D.), has made available several scholarships to some qualified Nigerians. Furthermore, some students have studied under the sponsorship of the African Service Program of American Universities (A.S.P.A.U.), while still others have been sponsored by various kinds of private groups. The above background has led to establishing the following specific objectives for this investigation:

1. To study the academic performance of Nigerian students now registered in institutions of higher learning in the United States and so provide a basis for the counseling of prospective students.

2. To determine if academic performance in a United States setting can be predicted for a Nigerian student before he enrolls in his first course in an institution of higher learning in the United States. In this way the educational experiences of Nigerian students may be made more meaningful.

3. To make available current information for sound future planning.

4. To suggest areas for further research.

Definition of Terms

A.S.P.A.U.

The African Service Program of American Universities. Through this program, administered by the African-American Institute with headquarters in New York City, a group of colleges and universities in the United States offer financial aid to some African students through their home governments.

G.C.E.

The General Certificate of Education is an external examination of London University. A pass in a subject at ordinary level in this examination is considered equivalent to a C score in the school certificate examination (see below). The advanced level of the examination is usually taken after the equivalent of the first two years

of college. Each candidate is examined in three or four subjects and the grade for each subject is given on a pass or fail basis. A distinction indicates an excellent score.

Grade II Teacher's Certificate

A Grade II Teacher's Certificate may be obtained in Nigeria by successfully completing a grade II teacher's training course which lasts four years beyond elementary school. The certificate is awarded following a passing grade in a comprehensive examination which is uniform in each of the four regions of the country. Equivalently, one could obtain a grade III certificate from a two-year institution, teach for a few years and then return to school to complete the last two years necessary for a Grade II certificate. Finally, high school graduates who wish may complete a 2-year course in methodology and obtain a Grade II Certificate.

Higher school

Higher school is an extension of the ordinary high school program in Nigeria and some other countries. The extended program lasts two extra years. At the completion of the prescribed program, each student takes an external examination, the Higher School Certificate Examination, of Cambridge University. A pass in a subject in this examination is considered equivalent to a pass in the same subject at the advanced level G.C.E. examination.

I.I.E.

The Institute of International Education administers programs for governments, foundations, and other sponsors of students. It provides services for foreign and American students and scholars and acts as a clearinghouse for information.

N.A.F.S.A.

This is the National Association of Foreign Student Advisors whose members are usually counselors of foreign students.

School Certificate Examination

This is a comprehensive examination taken at the completion of an approved high school program in Nigeria. It is a pass or fail examination in which the pass category ranges from grade one (high) to grade three (low). The grades assigned to each subject are A for excellent, C for good, P for pass, and F for fail.

U.S.A.I.D.

The United States Agency for International Development, an agency of the Federal Government of the United States charged with the administration of many international exchange programs.

Sources of Data

The data used in this study were collected through the use of a mail questionnaire sent to a random number of Nigerian students in colleges and universities in the United States. The questionnaire was preferred to the interview because of the wide geographical area involved. A less

elaborate questionnaire was mailed to the academic advisors of Nigerian students in those colleges and universities from which the sample was chosen. This provided a check on the validity of the returns from the students in the sample. The records of the Education Division of the Consulate General of Nigeria in New York City were used to determine the number of Nigerian students in the United States during the 1966-67 school year.

Delimitations of the Study

It should be emphasized that this study is concerned with the purely scholastic factors that are related to academic achievement. Thus, such social factors as sex, discrimination, age, marital status, change of food and change in environment are ignored. Also, it should be noticed that the questions posed in the specific objectives do not exhaust all possible questions that may be asked concerning the academic achievement of Nigerian students. However, the present study is limited to those questions.

Furthermore, a questionnaire study was decided upon only after it was discovered that many educational institutions would not release the official transcripts of the students in the sample. It was also deemed fit, because of time limitations, to include in the analysis those questionnaires, and those only, that were properly filled out and returned within 60 days of the mailing of the first questionnaire.

Organization of the Study

The material in this study has been arranged in the following manner: Chapter One is the introductory chapter. It includes the introduction, the statement of the problem, the purpose of the study, the definition of terms, the sources of the data, the delimitations of, and, the organization of, the study. Chapter Two is a review of literature. In Chapters Three and Four, respectively, the method of dealing with the problem and the findings are outlined. The fifth chapter includes a summary, conclusions and recommendations for further research.

REVIEW OF LITERATURE

The Prediction Problem

Let X be a group of animate or inanimate objects. The general prediction problem may be stated simply. Suppose the state of X is known at time, t_1, how can one proceed to obtain the state of X at time, $t_2 \neq t_1$, where t_2 is preceded by t_1?

The prediction problem is well-adapted to statistical techniques. Statistical methods applied in the investigation of this problem include analysis of variance, analysis of regression, analysis of correlation and analysis of covariance. These methods as well as discriminant analysis are now discussed.

Overview of Statistical Methods

An important statistical technique frequently used in studies in education is the analysis of variance. This statistical method has been designed to provide an efficient test of significance of the difference between two or more groups. It shall be used in the present study to check the validity of the response from the students in the sample.

In its simplest form, analysis of variance involves a contrast of the variance of individual values around group means within groups of equal size with the variance of the group means around the grand mean of the ungrouped data. Nonetheless, the general technique has been expanded to handle analysis of many kinds of complex experimental design. These designs include various types of factorial experiments, the latin-square

and the split-plot designs.

Certain assumptions are necessary for the correct application of the analysis of variance. Generally, a linear statistical model to which some restrictions are attached is assumed. The appendages may be summarized in the following manner:

1. Observations within each group must be random so that the effectiveness of the classification into groups may be tested accurately.

2. The data are assumed to come from a single normally distributed population.

3. The best estimate of the population variance can be obtained from the pooled variance among the subgroups.

In the simple case of the completely randomized block design with one observation in each experimental unit, the linear statistical model is given in the form:

$$Y_{ij} = \mu + a_i + e_{ij} \qquad (1)$$
$$i = 1, 2, \ldots, t$$
$$j = 1, 2, \ldots, n_i$$

In Equation 1, μ is the true mean effect

a_i is the true effect of the ith treatment

Y_{ij} is the jth observation in the ith treatment

e_{ij} is the true effect of the jth experimental unit subjected to the ith treatment. Usually, it is assumed that the treatment effects are additive, that is $\sum_{i=1}^{t} a_i = 0$ implying that the investigator is concerned with only those treatments present in his experiment.

More complex designs than the randomized group design are necessary whenever there is a need to control characteristics either known to influence the experiment or suspected of such an influence. But, whatever analysis of variance, simple or complex, is used, a test is usually made under a null hypothesis that there is no difference in the means or standard deviations of the various groups.

Sometimes, information is obtained on several related variables. A mathematical function is then sought which expresses both the nature of the relationship and the degree of association in the sense that the value of any one variable may be predicted from known values of the other variables. The applicable statistical techniques are termed regression methods and correlation methods.

Regression analysis is used to determine the best functional relation among variables. A suitable functional relation for a given population may be chosen after analytical consideration of the phenomenon involved or after an examination of scatter plots of the observed data. One common method of finding the best functional relation is called the method of least squares.

Consider the curve shown in Figure 1 in which the observed points are the points (X_i, Y_i); $i = 1, 2, \ldots, n$ where the X_i's are the independent variables and the Y_i's are the dependent variables. For a given value X_i of X, there is a difference, Di, called error, residual or deviation, between Y_i and the corresponding value as determined from the curve C. A measure of the goodness of fit of the curve C to the given data is provided by the quantity $\sum_{i=1}^{n} Di^2$. If this sum of squares is small,

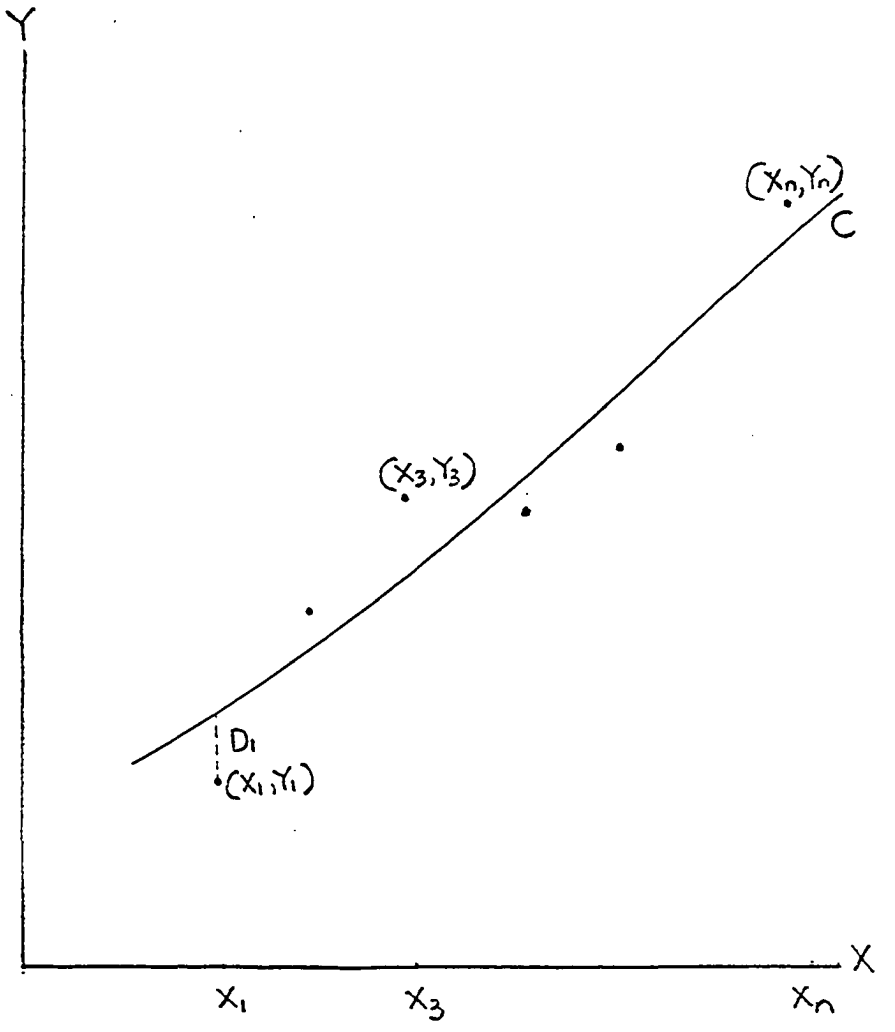

Figure 1. Least square curve

the fit is said to be good, otherwise the fit is said to be bad.

Thus, considering all the curves that may approximate a set of observed values, the curve having the property that $S = \sum_{i=1}^{n} Di^2 = \sum_{i=1}^{n} (Y_i-Y)^2$ is a minimum, is called a best-fitting curve. Any curve which satisfies the said minimum condition is said to fit the data in the least square sense.

S may be minimized through a familiar calculus process. This process calls for the differentiation of S with respect to each of the estimators and setting each of the partial derivatives to zero. As an example, in the case of the straight line, the equation of the line may be given in the form:

$$Y = mX + b$$

The values of Y on this line corresponding to $X = X_1, X_2, \ldots X_i, \ldots, X_n$ are $mX_1 + b, mX_2 + b, \ldots, mX_i + b, \ldots mX_n + b$ while the actual values are $Y_1, Y_2, \ldots, Y_i, \ldots, Y_n$ respectively.

Then the least square line is such that $S = \sum_{i=1}^{n} (b + mX_i - Y_i)^2$ is a minimum. By partial differentiation of S with respect to b and m and clearing of terms the following relations are obtained:

$$nb + m\Sigma X - \Sigma Y = 0$$

$$b\,X + m\Sigma X^2 - \Sigma XY = 0$$

These two equations, called normal equations, may be solved to obtain the values of b and m.

The assumptions made in analysis of regression may be summarized

thus:

$$Y_{ij} = a_o + a_1 X_i + e_{ij}$$

$$i = 1, 2, \ldots, t$$

$$j = 1, 2, \ldots, n_i$$

where n_i = the number of values of Y associated with the ith value of X. Also, Y_{ij} is the jth observation in the ith treatment $\sum_{i=1}^{t} n_i = n$ = the total number of values of Y and the e_{ij}, the error terms, are normally and independently distributed with mean zero and standard deviation d_E. It should also be pointed out that the relationship in an analysis of regression is not causal. For instance, Y = f(X) may be found to be a good fit for a set of observed data and yet no conclusion may be drawn as to a change in X causing a change in Y.

As distinct from regression analysis, correlation methods allow for the determination of the degree of association between variables. The resulting measure of correlation is commonly called a correlation coefficient. If all the values of the variables satisfy an equation exactly, it is said that the variables are perfectly correlated and the correlation coefficient takes its maximum possible value, unity.

In the words of Wert, et al. (44):

> The coefficient of correlation is a single value which is used to represent the relationship between two sets of data representing continuous variables, which have been collected for the same individual or which can be paired in some manner . . . it represents the extent to which changes in one variable are accompanied by equal changes in another, or the degree to which the data when plotted fall into a straight line.

There are two kinds of coefficients of correlation in use. The first is the Pearson product-moment coefficient named after Karl Pearson who developed it and the second is the Spearman rank order coefficient. Whenever the term coefficient of correlation is used without qualification it stands for the Pearson product-moment coefficient of correlation. Essentially, the difference between the two types of coefficients of correlation is that the product-moment type uses values in the distribution while the rank order type exchanges the values for the ranks.

Another useful statistical technique is the analysis of covariance. This statistical method combines the ideas of analysis of variance and analysis of regression. For instance, let groups be compared on the basis of response to a criterion. Suppose, also, that it is known that within the various groups, individual differences exist which influence the criterion. Then, it is important to control such differences. Analysis of covariance provides tests of significance for comparing groups whose members may have been stratified and measured with respect to any number of variable characteristics other than the criterion.

The assumptions made in analysis of covariance are similar to those required for regression and analysis of variance. These include the usual ones of homogeneity of variance, normality, independence, linearity and additivity.

There are numerous applications of analysis of covariance. It is especially useful for testing hypothesis pertaining to differences in academic achievement or performance. Allowance is then made for individual differences in aptitude or ability.

The last statistical technique to be discussed here is discriminant analysis. Often in studies in education, there are situations in which either the predictor variable or the criterion variable appears in two segments, that is, in a dichotomy. Whenever it is desirable to predict a dichotomy from several numerical variables, discriminant analysis is a very powerful tool.

Discriminant analysis may be handled as a regression analysis with similar assumptions. The equation used to predict a variable dichotomy is called a discriminant equation. A discriminant function, in general use for determining appropriate weights for a series of variables yielding optimal separation into two groups each of which is assumed to be normally distributed, was developed by Fisher in 1936.

The discriminant equation may be expressed in the form $y = \sum_{i=1}^{n} k_i x_i$ where the x_i's are numerical variables and the k_i's are coefficients which may be evaluated by solving simultaneous equations similar to the normal equations used in regression analysis.

Take as an example an attrition-survival study with two numerical variables, x_1 and x_2. The equations to be solved are:

$$Nzd_1 = k_1 \Sigma x_1^2 + k_2 \Sigma x_1 x_2$$

$$Nzd_2 = k_1 \Sigma x_1 x_2 + k_2 \Sigma x_2^2$$

where N is the total number of cases, z is the height of the ordinate dividing the normal curve of unit area into p and (1-p) parts, and d is the mean in each survival group minus the mean in the corresponding attrition-survival group for each variable.

Thus, since N, z, d_1, d_2, x_1, and x_2 are known, the solutions for k_1 and k_2 may be written in determinant form as:

$$k_1 = \frac{\begin{vmatrix} Nzd_1 & \Sigma x_1x_2 \\ Nzd_2 & \Sigma x_2^2 \end{vmatrix}}{\begin{vmatrix} \Sigma x_1^2 & \Sigma x_1x_2 \\ \Sigma x_1x_2 & \Sigma x_2^2 \end{vmatrix}} \quad ; \quad k_2 = \frac{\begin{vmatrix} \Sigma x_1^2 & Nzd_1 \\ \Sigma x_1x_2 & Nzd_2 \end{vmatrix}}{\begin{vmatrix} \Sigma x_1^2 & \Sigma x_1x_2 \\ \Sigma x_1x_2 & \Sigma x_2^2 \end{vmatrix}}$$

In summary, a few of the more common and valuable statistical techniques have been discussed in this section. Some of these techniques, including analysis of variance, analysis of regression, and analysis of covariance shall be applied in the present study.

Earlier Studies Involving American Students

In the United States studies dealing with the prediction of academic achievement of native students in institutions of higher learning have captivated the attention of many educators. Such studies have been of particular concern to high school and college administrators. Yet, many unresolved issues remain.

Through the nineteenth century and into the early part of this century, it was thought that a certain pattern of high school preparation was necessary for success in a higher educational institution. This belief became questionable as a result of studies done during the 1920's and 1930's. In Colebank's (7, p.149) words:

> No convincing evidence has made certain that a four years' secondary school course consisting largely of quite formal studies in foreign language and mathematics, taught by the methods which have long been customary in preparatory and

> other secondary schools, actually lays better foundation for successful college work and for subsequent success in life than courses of a different character.

In 1927 Bolenhaugh and Proctor (3) arrived at a similar conclusion after an analysis of the academic achievement of male students admitted into Stanford University in 1921 and 1922. Their study excluded all foreign students, all special students and all other students with incomplete records. It was an extremely well-designed project in which the students in the sample were followed through their college career.

Bolenhaugh and Proctor concluded that their investigation revealed that:

1. There was no significant difference between those students admitted into Stanford after an academic pattern of high school work and those admitted through a vocational program.
2. The vocational type student tended to be more consistent in his scholarship.
3. A good high school record, regardless of the pattern of subjects taken, when combined with a standard intelligence test, was a better basis for selecting candidates for college admission than either the high school record or the intelligence test alone.

A study was completed in 1931 by Williamson (45) on the scholastic aptitude of 1,010 freshmen in selected private colleges in the State of Minnesota. Was the prognostic use of psychological test ratings and high school scholarship ratings justifiable? Did the statewide testing and guidance program for high school seniors discriminate between high-aptitude and low-aptitude students in regard to their intention to attend

college? These were the questions Williamson set out to answer.

His sample was separated into three groups: fall-tested non-Minnesota high school graduates, spring-tested Minnesota high school seniors and fall-tested Minnesota high school seniors. He collected and analyzed data on college aptitude rating (an average of high school rank and rank in psychological tests), high school scholarship percentile rank and college ability rank.

Williamson found that there was no significant difference in the order of college achievement for the three groups. Also, he concluded that the best predictor of superior scholarship of high-aptitude freshman students was their college aptitude rating. In the same year Clark (6) at Northwestern University concluded that a combination of high school average and high school rank was a better predictor of first and second semester freshmen college grades than either of them used alone.

Edds and McCall (12), by multiple correlation methods, found that college marks could be predicted to the extent of $R_{o(123)} = .81$ where the o represents college marks, 1 represents high school marks, 2 represents intelligence tests and 3 stands for ability in English. Their study revealed that when the three criteria were considered separately the regression equation showed that high school record should be weighted twice as much as results in English ability.

A study was carried out by Tuttle (42) on 2,143 students who entered the University of Illinois as freshmen in 1934. Tuttle was interested in determining the predictive value of rank in high school graduating class. He discovered that 71 percent of these entrants were in the upper 50 percent of their class in secondary school and that 76 percent of those who

ranked in the upper 25 percent of their high school graduating classes maintained a C average or better during their first year at the University of Illinois. On the other hand, 85 percent of those who graduated in the lowest 25 percent of their secondary school classes were unable to maintain a C average.

In 1939 Nemezek (32) published an investigation in which he evaluated the usefulness of certain factors for direct and differential prediction of academic success. The factors considered were: intelligence quotient, chronological age at entrance to grade school, amount of education of parents, and occupational status of the father. The sample was composed of 196 male and 156 female graduates of the University High School of the University of Minnesota. Academic success was measured by honor point average. This study revealed that only intelligence quotient had predictive value and that for direct prediction only.

Hepner (20) carried out a study on some of the elements in the background of the student that relate to his variation from a level of academic achievement in college predicted for him on the basis of his secondary school records. He developed his prediction equation on a random group of 600 freshman students who entered San Diego State College in 1934 and 1935. Hepner, then, used the equation on an experimental group of 382 students selected with the same general criteria. He concluded that the use of high-school averages uncombined in a regression equation with the American Council percentile scores was of practical predictive value.

Furthermore, the increased labor involved in the use of combined

criteria was not justified by the corresponding increase in accuracy. And, relatively high ability to read comprehensively was a characteristic that separated students of good promise from other students at the beginning of their college career. But, it did not indicate in any reliable manner an association between actual and predicted college grades. In his conclusion, Hepner warned against over-reliance on grouped data.

At the State University of Iowa, Atkinson (1) studied 1,712 students in engineering, English, law and medicine. He concluded that:

1. High school class rank was related to the probability of success at the University.
2. The student's rank in his graduating class affected entrance to the University since students in the bottom 33 percent of their secondary school class tended not to apply for admission.
3. No particular curricular pattern was best-suited to preparation for a college program in the four fields since first year advantages or disadvantages relating to high school backgrounds did not persist through a four year undergraduate program.

In 1940 Mitchell (30) at Michigan State College and Eaton (11) at Indiana University investigated attrition-survival rates of students, using discriminant analysis. Mitchell found that nearly 36 percent of the male students withdrew from the freshmen classes of 1937-40 at Michigan State College. Furthermore, over 75 percent of the dropouts maintained less than a C average while in college. Eaton's investigation revealed that approximately 20 percent of the student body dropped out of Indiana

University. Of these dropouts, only about 20 percent transferred to other institutions of higher learning.

Garrett (18) reviewed 194 investigations made before 1949. He reported that high school scholastic performance had the best predictive value of the factors considered in all of those studies. In addition, Garrett discovered much evidence in support of the hypothesis that no particular secondary school curricular pattern was best-suited for college work.

Investigations in the 1950's and 1960's included those done by Hensel (19), Kerr (26), Knutson (28), Pabst (36), Scott (39), and Wolins (46). Kerr analyzed the records of 884 students in the freshman class of 1956 at the University of Arkansas. His purpose was to determine reliable criteria for selective admission. He concluded that there does seem to be a definite relationship between high school and college grades. However, according to him:

> Within the scope of this study, no criteria have become evident for selective admission which would not do injustice to an appreciable number of students.

An outstanding study was completed in 1961 at Iowa State University by Wolins on students entering the university, either in one of the summer terms or in the fall term, of 1960. There were 1,404 students who met Wolin's criteria of having taken the American College Testing Program tests and having scores on all tests administered to entering freshmen at the institution. For the purpose of his statistical analyses, Wolins divided his sample into five blocks: Agriculture, Engineering, Home Economics, Science Females and Science Males. He obtained regression

equations for each of the five groups.

Wolins discovered that, with few exceptions, each of the tests involved contributed substantially to the prediction of first quarter grades for freshmen students in at least one college. The exceptions were the reading portion of the Iowa State University battery and both the linguistic and quantitative scores on the American Council on Educational Psychological Examination. Furthermore, Wolins discovered that the best single predictor was high school grade-point average.

Scott (39) investigated the records of 1,095 graduates of the College of Arts and Sciences at the University of Arkansas. He found that the average grade earned in all courses taken in mathematics in high school was a good predictor of success in college mathematics and science. So were the grades earned in high school biology, chemistry, general science and physics. However, none of these was a good predictor of success in geology and the grade received in high school biology was not a good predictor of success in college chemistry or college physics.

In a study completed in 1965 at Indiana University, with 1936 freshmen who entered Indiana State University either in 1959 or 1963, Pabst (36) revealed that high school rank, English facility and good performance in high school social studies were the best predictors of academic success in college. His study showed that the grade-point averages of female students were predicted more reliably than those of male students.

Knutson investigated the admission requirements of State Universities and Land-Grant Institutions. He analyzed the opinions of people directly connected with admission requirements at both the high school and college

levels. His findings are given here in his own words (28, p.338):

> The usual requirement pattern of institutions could be summarized as follows:
> 1. A diploma or certificate of graduation from an accredited high school was a basic requirement.
> 2. The high school diploma was most frequently teamed with various subject-matter requirements, the pattern of requirements varying among several colleges or schools of the same institution.
> 3. The typical basic requirements were, then, graduation from an accredited high school together with certain subject-matter requirements. If these requirements could not be met, most state institutions permitted entrance through other means or combination of means.

A valuable study was completed in 1962 at Iowa State University by Hensel (19). His purpose was to determine the relationship between high school course-work and academic success at the university. Hensel used two samples. The first sample was made up of 2,013 freshmen who survived the fall quarter of the 1955-56 academic year. The second sample was comprised of students who had completed at least three quarters of college work at Iowa State University in the same college in which they were first enrolled. There were 1,650 students in this group.

Hensel divided the students in his sample into five groups within the four colleges from which he drew his sample. These were: Agriculture Males, Engineering Males, Home Economics Females, Science Females and Science Males. He collected and coded data (using the official university transcripts) on: high school grade-point average; high school semester credits in eight subjects (including mathematics, English and science); university quarter-point average; university credits; record as to enrollment, withdrawal or graduation; and number of college and curriculum changes.

Doing his analysis by college, Hensel (19, p.90) commented on his results thus:

> Findings in this study indicate that significant relationships did exist between certain pre-college variables and achievement in the different colleges at the Iowa State University. Three pre-college variables which tended to be most useful as predictors of college achievement were the high school grade-point average, the mathematics placement test score, and the English placement test score. Once the student had completed one quarter at the University, the best predictor of future grades of graduation tended to be the student's most recent college grade-point average.

Previous Studies on Foreign Students

As is to be expected, studies involving the prediction of academic achievement of foreign students are much less numerous than those on American students. Specifically, much investigation needs to be carried out on the prediction of the academic achievement of students from the young and developing countries of the world. Nevertheless, some studies involving foreign students have been done especially in the 1950's and 1960's.

Elaine Forstat (16) explored specific areas in which international students at Purdue University encountered difficulties. Her mail questionnaire to 201 foreign students in West Lafayette included a checklist of problems. She discovered that academic status and country of origin were factors associated with the total number of adjustment problems of the students in her sample. On the other hand, age, length of stay in the United States, and field of study appeared unrelated to difficulties encountered by foreign students.

In one of his studies, Hountras (22) investigated factors relating

to the academic achievement of foreign graduate students enrolled at the University of Michigan in the years 1947 to 1949. He studied and analyzed the records of 587 foreign graduate students, 257 of whom were on academic probation sometime during the period under study.

Hountras concluded that:

1. There was a significant relationship between the geographical origin of the students and their academic achievement. Students from the Far East, Near East and Latin America were more likely to be on temporary enrollment than those from other parts of the world.

2. There was a significant relationship between academic achievement and field of study. Students in the social and physical sciences were more apt to incur probation than those in the other broad academic areas.

3. There was predictive association between academic achievement and such variables as type of admission, degree held at admission, marital status and length of residence in graduate school. In connection with the last factor, academic difficulties were almost concentrated in the first and second terms of enrollment.

4. There was no significant relationship between academic achievement and variables like sex, age at entrance, employment status and summer attendance.

In another study, Hountras (23) reviewed Miller's work and a study done with the Miller Analogies Test at the University of Michigan on foreign graduate students. He concluded that the test should be included in the admission requirements of foreign graduate students because it showed great promise as a yardstick for selecting foreign students who

have the knowledge, aptitude, ability and skill to profit from graduate education.

Moore's (31) study was done on foreign students at the University of Minnesota in 1951-52. These students were mainly from China, India and Norway. He found that the individual educational institutions in the United States did not attract a proportional sampling of foreign students when area of origin, sex, field of study and graduate-undergraduate status were considered. Motivation stood out as a primary factor in the academic achievement of foreign graduate students. The factors found to correlate highly with poor achievement were English language deficiency, lack of motivation, delayed or improper vocational choice and cultural imbalance. Moore's comparisons revealed no significant statistical differences between the academic achievements of the foreign and American graduate students whose records he studied. Moore commented, in his conclusion, on the difficulty of assigning accurate grade to foreign students.

In 1953, Putnam (37) studied 546 foreign students at Columbia University. He investigated their academic performance, relations between first term grades and grades in subsequent enrollment and association between grade-point average and English language background, admission status, major, age, sex, national origin, years of experience, scholarship awards and undergraduate academic standing.

Putnam found that first term grade-point average correlated highly with both overall grade-point average and remainder grade-point average. It would have been a satisfactory predictor of total grade-point average

in 94.2 percent of individual cases. In addition, he found that English facility was important but that age, admission status, scholarship awards and national origin had no appreciable relationship with academic achievement.

Violet Clark (6) studied the cross-cultural academic experience of Ghanaian students in the United States during the 1959-60 academic year. She defined academic achievement as the rating of the student on a pass or fail basis by the educational institution attended and academic satisfaction as the satisfaction of the student with the academic standing assigned to him by the institution. Clark, then, sampled two populations: Ghanaian students in the United States and the educational institutions they were attending.

Subsequently questionnaires were mailed to 190 students and 98 educational institutions. All the institutions returned the questionnaires properly filled. The return from the students was 76 percent. Clark investigated factors selected from the educational background of the students in Ghana and the characteristics of the responding students and of the educational institutions. Her findings were reported at the five percent level of significance.

She discovered that significantly more students were passing who:

1. held government grants than those who did not
2. attended accredited institutions
3. held the equivalent of the advanced level General Certificate of Education.

In addition, the investigation revealed a significant difference in

satisfaction between married and unmarried students. Significantly more of the former were satisfied than the latter. Also students 30 years or older were more satisfied than those under 30.

Finally, an important survey of students from Africa South of the Sahara, excluding the Union of South Africa, was carried out in 1961. This survey was made by the Institute of International Education through the International Center of the University of Michigan. Writing in the foreword to the Survey Report (24), the President of the Institute of International Education defined the purpose of the survey thus:

> The assignment was to obtain comprehensive, up-to-date statistical information on African students in the United States during 1961, their backgrounds, major problems, educational and social experiences and future plans.

There was a total of 1,600 students who qualified for the population. The investigating team located and sent mail questionnaires to 1,533 of these. Sixty-seven percent of the recipient students returned the questionnaires. Following the returns, a sample of 208 of the students and 112 institutional administrators in 43 of the 366 colleges and universities were given an oral interview.

The survey (24) found the composite student in the population to be "a 26-year-old single male from either Nigeria or Kenya who was beginning the junior year and was studying social science." Twenty-seven percent of the students were freshmen, 17 percent were sophomores, 16 percent juniors, 10 percent seniors and 22 percent graduate students.

In spite of the fact that about 50 percent of the students were still in their initial adjustment phase, 79 percent of them reported satisfaction with their academic program. In the words of the report:

> In contrast to American students who frequently change their major field of study, only a handful of the African students have changed their major since their arrival here. This seems to indicate that they have semi-definite ideas about their academic interests, although they may not have as definite ideas on how they will be able to apply their knowledge upon their return home.

The students reported that their major problems were in communication, discrimination, adjustment to school, academic work, adjustment to the United States, social adjustment, finance, food and homesickness. Six percent of the students reported having academic difficulties. The major reasons given by the students for academic problems were language and comminication differences and the difficulty of adjusting to the American educational system with its objective tests and fast pace.

The overall grade-point average of the sample as reported by the students was a B-, which seems relatively high. However, it should be remembered that 22 percent of the sample was made up of graduate students who are expected to maintain no less than a B average. The only check on the accuracy of the students' responses was provided by opinions voiced by 31 academic advisers. Thirty-six percent of these thought the African students were doing better than American students, 23 percent thought the African students were doing worse and 19 percent thought there was no appreciable difference.

The academic advisers agreed with the students that there were communication problems and that it was not easy adjusting to objective tests. They added that in some cases preparation was inadequate. Nevertheless, most of the advisers "believed that a majority of the students make satisfactory academic progress after an initial period of adjustment."

Observations, Evaluations, and Summary

A survey of the literature in the general area of prediction of academic achievement revealed a wealth of studies. The methods used ranged from simple chi-square and single-classification analysis of variance to the more sophisticated analysis of covariance and discriminant analysis.

This review of literature has considered methods commonly employed in research on academic prediction. Also, it has summarized several studies done in this broad area. Investigations carried out at Iowa State University as well as those performed in several other educational institutions have been included. Furthermore, some of the studies included have involved natives of the United States while others have involved foreign students. Obviously, no attempt has been made to include all the research that has been done on academic prediction.

Some of the findings were unusual, some surprising, some apparently contradictory to others. Elaine Forstat's conclusion that the adjustment problems of international students were not correlated to the students' length of stay in the United States sharply contradicted the conclusion arrived at by the team that did the 1961 survey on African students. In the words of that survey report (24):

> As the length of stay increased . . . communication difficulties which had been listed initially by 21% was later important to only 4%. . . . The importance of the diet also declined. . . . While the American way of life may not have been what the students generally expected, adjusting to it was apparently not difficult. It decreased as a major problem from 17% for the students when they first arrived to 3%.

Of course, the populations were different. Nevertheless, it would appear that, while a linear relationship may not exist, the longer a foreign student stayed in any country, the better able he is to adjust to economic, cultural and educational differences between that country and his country.

In general, high school grade-point average was the most important pre-college predictor of college success for native students. Other good predictors were rank in high school graduating class, English placement test scores, mathematics placement test scores, and scores on some intelligence tests. For foreign students, English deficiency and lack of motivation correlated highly with poor academic achievement.

METHOD OF PROCEDURE

This study dealt with Nigerian students in colleges and universities in the United States during the academic year 1966-67. According to the records of the Education Division of the Consulate General of Nigeria in New York City (33) there were 1,882 such students. Of this number 1,426 were undergraduates and the rest were graduate students.

A representative sample of the students was chosen using proportional sampling methods. Two overriding principles in the selection of the sample were its adequateness and representativeness. Hence, the total population was separated into two; undergraduates including students in professional schools who had not obtained a first degree, and graduate students.

From each of the two sub-populations, a representative sample was chosen. This was done by arranging the names of the students alphabetically. From the sub-population of graduate students the first of each group of five names was selected while from the subset of undergraduates the first of each set of ten names was chosen. Thus, questionnaires were mailed to 143 undergraduates and 92 graduate students. Sixty-five of the latter and 104 of the former returned the questionnaires completely and properly filled. That is, approximately 72 percent of the undergraduate and 71 percent of the graduate students sampled were employed in the analysis.

Data were collected on the background of the students while in Nigeria, their financial sponsorship, and academic performance in the United States. In addition, a shorter questionnaire was mailed to the

faculty adviser of each student in the sample. As a result, the validity of the response of the students was checked by carrying out an analysis of variance between the cumulative grade-point averages reported by the students and those reported by the academic advisers.

For the purposes of the statistical analysis, the school certificate and university records of the students were coded for use in computing systems. Letter grades in the school certificate examination were assigned the following numerical values:

A = 4
C = 3
P = 2
PF = 1
F = 0

Overall grades in the same examination were assigned the following numerical values:

Grade One = 3
Grade Two = 2
Grade Three = 1
Failure = 0

The first matter of concern was the use of pre-college scholastic characteristics to predict academic achievement. In Nigeria, much emphasis is placed on a student's grade in the school certificate examination. A student who obtains a first grade certificate is generally considered capable of good work in an institution of higher education, a student who earns a grade two certificate is, most times, regarded as a worthy risk and a student who obtains a grade three pass is usually discouraged from further academic pursuits.

Of interest, then, was how satisfactorily the results of the school certificate examination predicted academic achievement as measured by a

student's cumulative grade-point average. In the prediction equation that was developed, the grade in a school certificate examination was represented by the variable X_1.

Two other predictor variables were used because of the special importance attached to both. The first was the score in the English language part of the school certificate examination which was represented in the prediction equation by the variable X_2. The remaining independent variable, X_3, was the score in elementary mathematics.

Another part of the problem was to discover any significant differences in academic achievement between those Nigerian undergraduates who completed the equivalent of the higher school certificate examination and those who came to the United States by way of the ordinary high school. An analysis of covariance was carried out using the cumulative grade-point average as the measure and the best predictor among X_1, X_2 and X_3 as covariate. A similar analysis of covariance was performed between the scholarship and non-scholarship undergraduate students in the sample.

Furthermore, there was interest in discovering the most satisfactory method of predicting the academic achievement of the undergraduates in the sample when their cumulative grade-point average was used as the measure, Y. A regression equation was developed using X_3, the best of the pre-college predictors, and new independent variables X_4 and X_5. It should be explained that X_4 represented the student's first term college grade-point average and X_5 his cumulative grade-point average at the end of the first term of his second year in college. In the process, an examination was made to find out if X_5 was a satisfactory predictor of Y

and if X_4 was an acceptable predictor of X_5 or of Y.

The last part of the study was concerned with the advantage to a Nigerian graduate student of receiving his bachelor's degree in the United States. An analysis of covariance was involved. The measure was the cumulative grade-point average and the variables X_1, X_2 and X_3 were used as covariates.

FINDINGS

General Information

One hundred and four undergraduates studying in Washington, D.C. and 30 states returned properly completed questionnaires. The students ranged in age from 20 years to 39 years where the average age was 24.8 years. There were six freshmen, 23 sophomores, 30 juniors and 45 seniors. Fifty-eight of these students completed the equivalent of the higher school certificate and 74 were scholarship students.

The breakdown of the major academic areas of the undergraduates in the sample is as follows:

Science and Humanities	31
Engineering	28
Agriculture	24
Business	9
Medicine and Veterinary Medicine	5
Education	4
Home Economics	3

The first term grade-point averages ranged from 1.60 to 4.00 on a scale in which 4.00 represented an A. On the same scale, the cumulative grade-point averages ranged from 1.50 to 3.92. The mean first term grade-point average was 2.87 while the mean cumulative grade-point average was 2.91. In Table 1, the number of undergraduates in chosen grade-point average ranges is shown.

As for the graduate students, 65 in 26 states and Washington, D.C. returned completed questionnaires. Forty-two of these received first degrees in the United States. The others received initial degrees either in Nigeria or in the United Kingdom. The graduate students in the sample

Table 1. Number of Nigerian undergraduates in selected grade-point average ranges (A = 4.00)

Range	First term average	Cumulative average
Below 2.00	5	5
2.00 - 2.49	20	15
2.50 - 2.99	32	34
3.00 - 3.49	26	37
3.50 - 3.99	20	13
4.00	1	0

were enrolled in the following academic areas:

Science and Humanities	29
Education	12
Engineering	11
Agriculture	6
Medicine and Veterinary Medicine	3
Business	2
Home Economics	2

The cumulative grade-point averages ranged from 2.60 to 4.00 on a scale in which 4.00 represented a perfect average. Two students maintained an average of less than 3.00. There were 15 students whose averages fell somewhere between 3.00 and 3.24 and 14 whose averages were in the range 3.25 to 3.49. Of the remaining 34 students, 22 maintained averages between 3.50 and 3.74 and 11 averages between 3.75 and 3.99. One student had a perfect average.

These graduate students listed their chief financial sources as follows:

United States Agency for International Development	20
Self, Relative or Other	15
Federal Government of Nigeria	10
Graduate Assistantships	9
University Fellowships	4

African-American Institute	3
African Students Programs at American Universities	3
Rockefeller Foundation	1

Validity Check

The faculty advisers of 54 of the graduate students and 89 of the undergraduates returned completed questionnaires on the cumulative grade-point averages of their advisees. Table 2 shows the pertinent data.

Table 2. Cumulative grade-point average of Nigerian students

	Cumulative grade-point average as reported by students		Cumulative grade-point as reported by faculty adviser	
	Total	Mean	Total	Mean
Undergraduates	258.29	2.90	258.25	2.90
Graduates	186.26	3.45	186.02	3.44

For the undergraduates as shown in Table 2, there was no difference between the mean cumulative grade-point average reported by the students and that reported by the faculty advisers. Thus, the null hypothesis that there was no difference between the two means was trivially satisfied.

As for the 54 graduate students, an analysis of variance was performed to see if the difference of .01 in the mean cumulative grade-point was significant. This is shown in Table 3.

Table 3. Analysis of variance of the cumulative grade-point averages of Nigerian graduate students

Source of variation	Degrees of freedom	Sum of squares	Mean square
Groups	1	.001	.001
Within	106	151.437	1.43
Total	107	151.438	

$F = \frac{.001}{1.43} < 1.00$ and nonsignificant

Multiple Regression Analysis on Nigerian Undergraduates

The 104 undergraduates in the sample were used in a multiple regression equation where the criterion was the student's cumulative grade-point average. The regression equation and variables employed were as follows:

$$Y = b_1X_1 + b_2X_2 + b_3X_3 + b_4$$

where Y = Cumulative grade-point average

X_1 = Grade in the school certificate examination

X_2 = English language score in the school certificate examination

X_3 = Mathematics score in the school certificate examination

b_1, b_2, b_3, and b_4 were appropriate constants.

First, a test was made using the null hypothesis that the variables X_1, X_2, and X_3 did not predict academic achievement as measured by Y. The significance of the regression was tested employing all these three independent variables as shown in Table 4.

Table 4. Analysis of multiple regression using grade in the school certificate examination, score in mathematics in that examination and score in English language in the same examination to predict academic achievement

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression	3	2.342	0.781
Residual	100	23.063	0.231
Total	103	25.405	

$F_{3,100} = 3.385^*$ $\quad R^2 = 0.092$

$F_{3,100} = \frac{2.70}{3.98}$ table value $\quad SE = 0.480$

*F value is significant beyond the one percent level.

With the known coefficients the regression equation became

$$Y = .046X_1 - .046X_2 + .151X_3 + 2.376$$

In turn, tests for significant loss were made by eliminating each of the variables X_1, X_2, and X_3 respectively. These tests are given in Tables 5, 6, and 7.

The variable, X_3 was the only one of the three predictor variables whose elimination gave rise to a significant loss at the one percent level. The regression equation with this, the best predictor of the set, is $Y = .161X_3 + 2.397$. Figure 2 is a diagrammatic representation of this relationship.

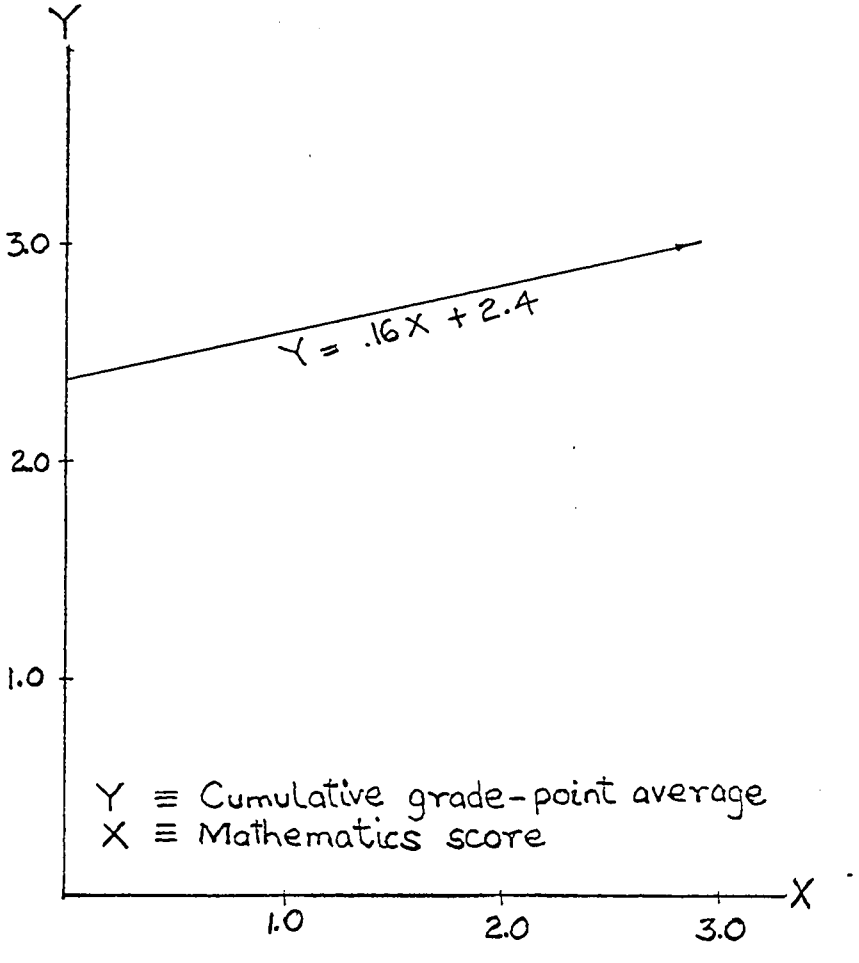

Figure 2. Cumulative grade-point average as a function of score in mathematics

Table 5. Test for loss due to the elimination of the grade in the school certificate examination

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression (X_1,X_2,X_3)	3	2.342	0.781
Regression (X_2, X_3)	2	2.280	1.140
Loss due to X_1	1	0.062	0.062
3 variable residual	100	23.063	0.231

$F_{1,100} = 0.268 < 1$ and nonsignificant

Table 6. Test for loss due to elimination of the English language score in the school certificate examination

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression (X_1,X_2,X_3)	3	2.342	0.781
Regression (X_1, X_3)	2	2.227	1.114
Loss due to X_2	1	0.115	0.115
3 variable residual	100	23.063	0.231

$F_{1,100} = 0.50 < 1$ and nonsignificant

Table 7. Test for loss due to elimination of the score in mathematics in the school certificate examination

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression (X_1,X_2,X_3)	3	2.342	0.781
Regression (X_1, X_2)	2	0.989	0.495
Loss due to X_3	1	1.353	1.353
3 variable residual	100	23.063	0.231

$F_{1,100} = 5.85$* $F_{1,100} = \frac{3.94}{6.90}$ table value

*F value significant above the one percent level.

Quantitatively, R^2, the squared value of the coefficient of multiple regression with the score in mathematics as the only predictor, was 0.087. However, R^2 was an indication of the proportion of the variance of the criterion that was attributable to the predictor variable. Hence, approximately nine percent of the academic achievement of Nigerian undergraduates as measured by their grade-point averages could be assigned to differences in their scores in mathematics in the school certificate examination. This detracted, to some extent, from the significance of the F value.

Academic Achievement of High School and Higher School Graduates

Among the undergraduates in the sample, 58 completed the equivalent of the higher school certificate and 46 the equivalent of the usual high

school course of five years. An analysis of covariance was employed to discover if there was a significant difference between the academic achievement of the two groups.

The score in mathematics in the school certificate examination which earlier was found to be the best predictor for undergraduates was used as a control. By using this covariate, any bias introduced by individual differences was eliminated in so far as the score in mathematics adequately represented the said differences. The test is given in Tables 8 and 9.

Table 8. Multiple regression using score in mathematics in the school certificate examination and cumulative grade-point average in college for higher school and high school graduates

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression	2	1.682	0.841
Residual	101	22.745	0.225
Total	103	24.427	

$F_{2,101} = 3.738^{*}$ $F_{2,100} = \begin{matrix} 3.08 \\ 4.78 \end{matrix}$ table value $R^2 = 0.085$

*F value significant above the one percent level.

In Table 9, there was a test for loss of the cumulative grade-point average in college. The F value was significant above the one percent level indicating that beyond this level the higher school graduates were performing better than the high school graduates since it was known that

Table 9. Test for loss of cumulative grade-point average in college

Source of variation	Degrees of freedom	Sum of squares	Mean square
2 variable regression	2	1.682	0.841
1 variable regression	1	0.701	0.701
Loss due	1	0.981	0.981
2 variable residual	101	22.745	0.225

$F_{1,101} = 4.35^{*}$ $F_{1,100} = \begin{matrix}3.94\\6.90\end{matrix}$ table value

*F value significant above the one percent level.

the mean cumulative grade-point average of the latter was lower.

Scholarship versus Non-Scholarship Undergraduates

There were in the sample of 104 undergraduates 74 who were on some type of full-time scholarship arranged through either the federal government of Nigeria or through one of the four regional governments of the country. The sponsors of these scholarship students were:

United States Agency for International Development	36
African Students Programs at American Universities	31
Federal Government of Nigeria	6
Institute of International Education	1

All the external scholarship awards involved here were made through either the federal government of Nigeria or through one of the regional governments in the country. Nigeria got bulk grants from the United States Agency for International Development in the form of low-interest

long-term development loans. Through these grants competent persons were expected to be selected and trained for service to the four regions of the country.

The various scholarship programs had certain characteristics in common. The sponsor was responsible for the tuition and fees of each scholarship holder. In addition, each scholarship student received a maintenance allowance of approximately one hundred and thirty-five and two hundred and ten dollars each month. Other benefits included free transportation from Nigeria to the recipient's college or university and free transportation back to Nigeria at the termination of the program. Included also was a medical insurance that was at least partly paid for by the sponsor.

The scholarship students usually signed a bond to spend between two and five years in the service of one of the governments of the federation or to pay back some fixed amount of money in lieu of such service. Furthermore, they were required to stay in school and to attend any programs officially arranged for them. It was understood that the scholarship could be terminated any time the recipient failed to maintain the academic standards necessary to be in good standing at his college or university.

The 74 scholarship holders in the sample were contrasted with the 30 non-scholarship students. (it should be pointed out that the non-scholarship group included some students who held partial scholarships not awarded through any of the governmental agencies of Nigeria.) An analysis of covariance was performed using the score in mathematics in the school certificate examination, discovered earlier to be the best predictor

variable, as a control. The mean cumulative grade-point average of the scholarship holders was 2.93 and that for the non-scholarship students was 2.86. The difference of 0.07 was tested for significance. This test is shown in Tables 10 and 11.

Table 10. Multiple regression using score in mathematics in the school certificate examination and college cumulative grade-point average of scholarship and non-scholarship students

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression	2	2.278	1.139
Residual	101	23.127	0.229
Total	103	25.405	

$F_{2,101} = 4.975^{**}$ $\quad R^2 = 0.089$

$F_{2,100} = \frac{3.09}{4.82}$ table values $\quad SE = 0.478$

**F value significant beyond the five percent level.

Table 11. Test for loss due to the elimination of the college cumulative grade-point average of scholarship and non-scholarship students

Source of variation	Degrees of freedom	Sum of squares	Mean square
2 variable regression	2	2.278	1.139
1 variable regression	1	2.211	2.211
Loss due	1	0.067	0.067
2 variable residual	101	23.127	0.229

$F_{1,101} = \frac{0.067}{0.227} < 1$ and nonsignificant

There was no significant difference between the academic performance of the scholarship and non-scholarship students when the cumulative grade-point average was used as a criterion and the score in mathematics in the school certificate examination was used as a control.

Regression with Pre-College and College Predictors

Here, a regression equation was developed. This equation was of the form:

$$Y = b_3X_3 + b_4X_4 + b_5X_5 + b_6$$

where Y = cumulative grade-point average

X_3 = score in mathematics in the school certificate examination

X_4 = first term college grade-point average

X_5 = college cumulative grade-point average at the end of the first term of the second year

b_3, b_4, b_5, and b_6 were appropriate constants.

The constants were evaluated, and the values substituted into the regression equation which then became:

$$Y = .013X_3 + .071X_4 + .774X_5 + .402$$

The analysis of regression is shown in Table 12.

The F value was significant beyond the five percent level. It should be also noted that $R^2 = 0.832$, thus indicating that on the average approximately 83.2 percent of the cumulative grade-point average was predictable from X_3, X_4 and X_5.

Table 12. Analysis of multiple regression using score in mathematics in the school certificate examination, first term college grade-point average and college cumulative grade-point average at the end of the first term of the second year as the predictor variables

Source of variation	Degrees of freedom	Sum of squares	Mean square
Regression	3	21.117	7.039
Residual	100	4.266	0.043
Total	103	25.383	

$F_{3,100} = 165.023^{**}$ $\quad R^2 = 0.832$

$F_{3,100} = \begin{matrix} 2.70 \\ 3.98 \end{matrix}$ table value $\quad SE = 0.207$

**F value significant above the five percent level.

Next, separate regression equations were developed with each of the variables X_4 and X_5. The results are shown in Tables 13 and 14 and in graphic forms in Figures 3 and 4.

In each of Tables 13 and 14, the F value was significant beyond the five percent level. Also, as indicated by the value of R^2 in Table 13, a student's first term grade-point average could be used to predict approximately 52 percent of his cumulative grade-point average. Similarly, as shown in Table 14, a student's cumulative grade-point average at the end of the first term of his second year in college could be used to predict about 82.8 percent of his academic achievement.

The rest of the results obtained in this section are given in

Table 13. Analysis of regression with the first term college grade-point average as predictor

Source of variance	Degrees of freedom	Sum of squares	Mean square
Regression	1	13.166	13.166
Residual	102	12.217	.120
Total	103	25.538	

$F_{1,102} = 109.93^{**}$ $R^2 = 0.519$

$F_{1,100} = \frac{3.94}{6.90}$ table value SE = 0.346

**F value significant above the five percent level.

Table 14. Analysis of regression with the college cumulative grade-point average at the end of the first term of the second year as predictor

Source of variance	Degrees of freedom	Sum of squares	Mean square
Regression	1	21.107	21.017
Residual	102	4.366	0.428
Total	103	25.383	

$F_{1,102} = 490.984^{**}$ $R^2 = 0.828$

$F_{1,100} = \frac{3.94}{6.90}$ table value SE = 0.207

**F value significant above the five percent level.

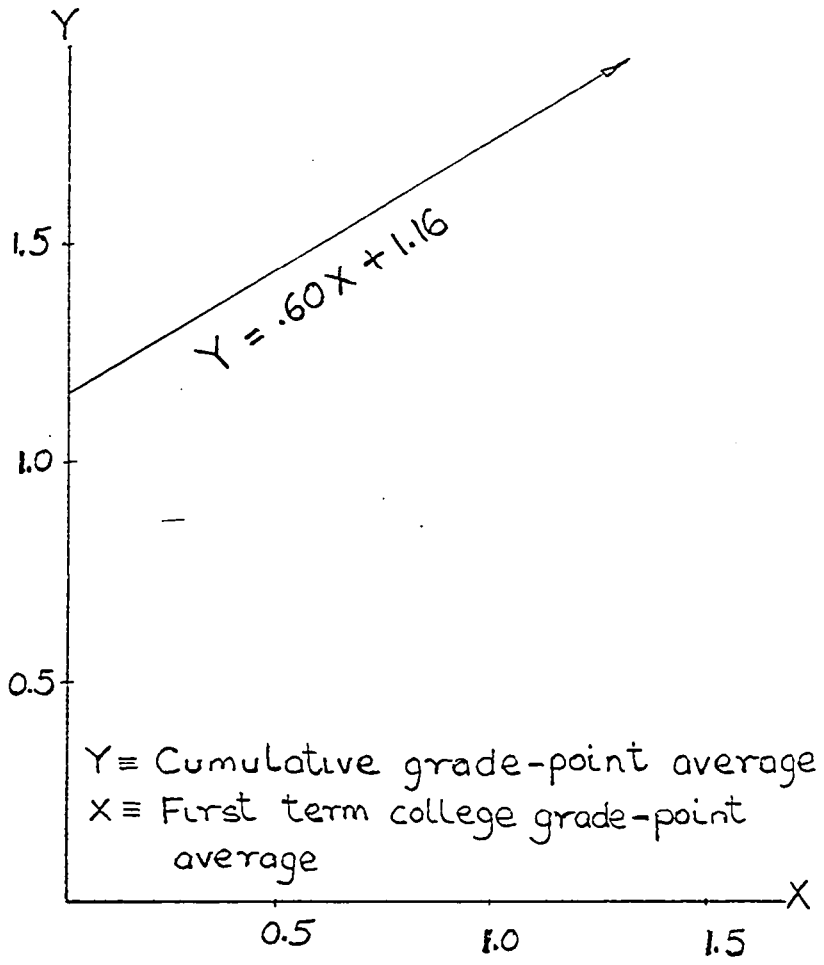

Figure 3. Cumulative grade-point average as a function of first term college average

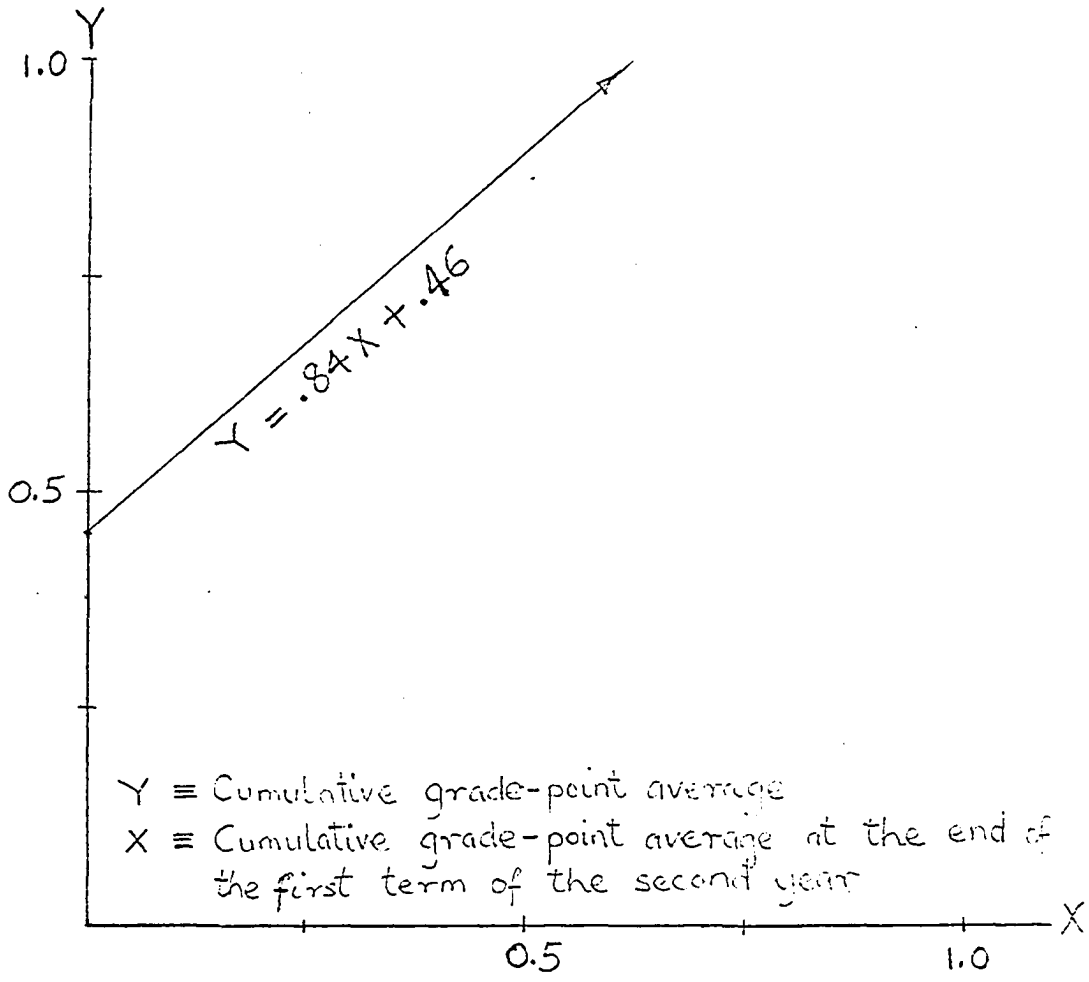

Figure 4. Cumulative grade-point average as a function of the cumulative grade-point average at the end of the first term of the second year in college

Table 15 in the form of a correlation matrix. It should be noted that in that table:

1 = Academic achievement as measured by cumulative grade-point average

2 = Mathematics score in the school certificate examination

3 = First term college grade-point average

4 = Cumulative grade-point average at the end of the first term of the second year in college

Table 15. Intercorrelations between academic achievement of Nigerian undergraduates and several factors

	1	2	3	4
1	1.00			
2	0.30	1.00		
3	0.72	0.29	1.00	
4	0.91	0.29	0.75	1.00

Thus, a high correlation (.72) was found to exist between the first term grade-point average and cumulative grade-point average. Another high correlation (.75) was discovered to exist between the first term grade-point average at the end of the first term of the second year in college. Furthermore, a very high correlation (.91) was found to exist between the cumulative grade-point average at the end of the first term of the second year in college and academic achievement. In fact, according to Wert et al. (44, p.424) all the correlations in Table 15 were significant.

Nigerian Graduate Students

The 65 graduate students ranged in age between 23 and 46 years. The average age was 28.9 years. Forty-two of the students received bachelor's degrees in the United States, 18 were awarded first degrees in Nigeria and three graduated from universities in the United Kingdom. Of the other two students, one graduated from the University of Ghana and the other from the University of Sierre Leone.

On a scale in which A = 4.00 the first term grade-point averages of the 23 who received initial degrees outside the United States were:

Below 2.49	2
2.50 - 2.99	1
3.00 - 3.49	8
3.50 - 3.99	8
4.00	4

One year later two of the 23 still maintained a perfect cumulative grade-point average and none of them had a cumulative grade-point average less than 3.00. The mean cumulative grade-point average of the 23 was 3.43 while the mean cumulative grade-point average in graduate school of the 42 who were awarded bachelor's degrees in the United States was 3.42.

The issue investigated here was whether there was a significant difference in academic achievement, as measured by cumulative grade-point average, between the 42 graduates of institutions of higher learning in the United States and the 23 students who obtained bachelor's degrees elsewhere. The null hypothesis that there was no difference in the academic achievement of the two groups was used in an analysis of covariance.

The covariates were:

X_1 = Grade in the school certificate examination

X_2 = Score in English language in the school certificate examination

X_3 = Score in Mathematics in the school certificate examination

All the controls X_1, X_2 and X_3 were poor predictors of academic achievement for the graduate students in the sample. The test for loss is shown in Table 16.

Table 16. Test for difference in cumulative grade-point average between two groups of Nigerian graduate students

Source of variation	Degrees of freedom	Sum of squares	Mean square
4 variable regression	4	0.179	0.045
3 variable regression	3	0.178	0.059
Loss	1	0.001	0.001
4 variable residual	60	5.735	0.096

$F_{4,60} = \frac{1}{96} < 1$ and nonsignificant

Thus, no significant difference was observed between the academic achievement of Nigerian graduate students who obtained bachelor's degrees elsewhere and those who earned bachelor's degrees in the United States.

SUMMARY, CONCLUSIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

Summary

This study surveyed Nigerian students in institutions of higher education in the United States during the academic year 1966-67 in order to determine some of the factors associated with their academic achievement. The measure of academic achievement was the student's cumulative grade-point average as reported by the student and, where possible, confirmed by his faculty adviser.

Blank questionnaires were mailed to 143 undergraduates and 92 graduate students selected through random sample methods from the total population of 1,882 students. However, only 104 undergraduates and 65 graduate students who returned the questionnaires properly completed within a two-month period were included in the analysis.

From the information collected the composite Nigerian undergraduate was a 25-year old junior or senior in engineering, social science or agriculture. On a scale in which A was represented by 4.00, he had a cumulative grade-point average of 2.91. This was quite consistent with the 1961 Survey of the African Student (24) which reported a mean grade-point average of B-. There was a 70 percent probability that this typical Nigerian undergraduate held a full-time college scholarship awarded through one of the agencies of the Federal Republic of Nigeria.

On the other hand, the representative graduate student was approximately 29 years old. There was a 65 percent chance that he had received his bachelor's degree from a college or a university in the United States.

More than likely, he was in social science or engineering. His cumulative grade-point average was 3.42 on a scale in which 4.00 represented an A.

The statistical analysis was handled in five parts. The first question of interest was the prediction of the probability of success prior to a Nigerian undergraduate enrolling in a college or university in the United States. Of the 104 undergraduates in the sample, 43 passed the school certificate examination in grade one, 47 passed in grade two, 11 passed in the third grade and three failed.

A regression equation was developed. The criterion was the cumulative grade-point average. There were three independent variables based on previous experience in Nigeria. These were:

1. The student's grade in the school certificate examination
2. The student's score in English language in the school certificate examination
3. The student's score in mathematics in the school certificate examination.

The mathematics score correlated .30 with cumulative grade-point average. According to Wert et al. (44, p.424), this was significant beyond the one percent level. The grade in the school certificate examination had a correlation of .18 with cumulative grade-point average. This just failed to be significant. As for the score in English language, its low correlation of .04 with cumulative grade-point average was well below what was needed for significance.

However, although the score in mathematics showed significance beyond the one percent level, the R^2 value associated with the F test showed that slightly less than nine percent of the academic achievement

of Nigerian undergraduates could be assigned to differences due to their scores in mathematics. There was therefore a need for discovering other factors that could explain better the differences in academic achievement.

That was the function of the second part of the analysis. There, the best pre-college predictor variable, score in mathematics, and two college variables were used in a regression equation in which the cumulative grade-point average was the measure. All three had significant correlations beyond the one percent level of significance with academic achievement. Moreover, together they could be used to predict slightly more than 83 percent of the student's academic achievement. But, more importantly, the best of the three, the cumulative grade-point average at the end of the first term of the second year in college, could be used alone to predict nearly 83 percent of the student's academic achievement.

Next, there was the question of discovering if there was any significant difference between the academic achievement of the scholarship and non-scholarship students. There were 74 of the former and 30 of the latter in the sample. An analysis of covariance was performed with the score in mathematics in the school certificate examination as the control. The F value was less than unity and so there was no significant difference.

The fourth part of the project investigated difference in academic achievement between Nigerian undergraduate higher school graduates and their high school counterparts. There were 58 of the former and 46 of the latter in the sample. An analysis of covariance was carried out using the mathematics score in the school certificate examination as a

covariate. The F test was significant beyond the one percent level indicating that the higher school graduates with a mean cumulative grade-point average of 3.02 were doing better than the high school graduates with a mean cumulative grade-point average of 2.78.

Finally, the academic achievement of graduate students was explored. Achievement was measured by the cumulative grade-point average in the graduate school. The question investigated here was whether there was a significant difference in academic achievement between 42 Nigerian graduates of institutions of higher learning in the United States and 23 Nigerian graduate students who received bachelor's degrees elsewhere before coming to the United States for further study.

The null hypothesis that there was no difference in achievement between the two groups was used in an analysis of covariance. Three covariates; the school certificate examination, the mathematics score in that examination and the English language score in the same examination; were employed. The F value was well below 1.00 indicating no significant difference between the mean cumulative grade-point average of 3.42 of the graduates of colleges and universities in the United States and the mean cumulative grade-point average of 3.43 of the graduates from elsewhere.

Conclusions

It should be remembered that the findings in this study were based on grouped data. Hence, indiscriminate application of these findings to individual cases should be avoided. It should also be kept in mind that in attempting to predict academic achievement we were not dealing with

fixed laws but in probabilities. In addition, there were many factors which affect academic achievement that were not examined by this study.

Bearing these reservations in mind, the following conclusions were drawn from the findings of this study.

1. Previous educational experience, as measured by the grade in the school certificate examination, of Nigerian undergraduates attending institutions of higher learning in the United States could not be used to predict satisfactorily the academic achievement of such students as measured by their cumulative grade-point averages.
2. Nigerian undergraduates who completed the equivalent of the higher school certificate examination performed better academically than those who did not. It seemed, on this basis, appropriate to recommend that as long as the Federal Republic of Nigeria continues its present policy of awarding scholarships for undergraduate studies in the United States the recipients of such scholarships be chosen from the population of higher school graduates.
3. It was discovered that there was no difference in academic achievement between those Nigerian undergraduates who held government scholarships and those who did not. It is my opinion that the government should carefully review its scholarship program to make sure that appropriate criteria are available for the selection of the best candidates and that the said criteria are strictly adhered to. In this connection, since

it was found that both the first term grade-point average and the cumulative grade-point average at the end of the first term of the second year in college correlated highly with academic achievement, it may be necessary to devise a system in which undergraduate scholarship recipients intended to study in the United States are selected from those Nigerian students who have completed at least one term in an institution of higher education in that country.

To make sure that this policy does not discriminate against students from poor financial backgrounds, the government should make funds available for forgivable loans. The scholarships for those undergraduates who finally qualify for scholarship awards could be made retroactive from the beginning of their academic program in the United States. Those students who fail to qualify for scholarship awards shall after graduation from college, be required to pay back their loan funds in cash or kind.

4. Another of the findings of this study was that there was no significant difference in academic achievement between those Nigerian graduate students who obtained bachelor's degrees in the United States and those who received initial degrees elsewhere. Yet, most of the latter were awarded bachelor's degrees in Nigerian institutions of higher education.

Thus, considering the fact that it costs much more to maintain a student in the United States than in Nigeria, it is recommended that the government discontinue its policy of awarding scholarships for undergradu-

ate study in the United States in any fields of study available in institutions of higher education in Nigeria as soon as possible. Furthermore, the government should encourage the five Nigerian universities to expand their offerings so that in the near future it will become unnecessary to send undergraduates to study outside Nigeria.

Suggestions for Further Research

The present study has not attempted to cover all the various factors that affect academic achievement. That would be a monumental, if not an impossible, task. For, how shall one be sure that every student is performing at maximum capacity? How shall one control all the imponderable factors of motivation? Finally, how shall one be sure that the evaluation method used is not putting some students at some disadvantage? Nevertheless, the struggle for improvement and for making the educational experience of students meaningful and relevant must go on. It is in this light that the following suggestions for future research are made.

To begin with, there is a fundamental need for a follow-up study of Nigerian graduates of institutions of higher education in the United States. Such a study could tap the experiences of these graduates while in the United States and the use that they have made of the knowledge acquired while in the United States since getting back to Nigeria. Was most of the course-work relevant. Should Nigeria continue to sponsor undergraduate study in the United States? A wealth of information could be collected on these and other issues that should be helpful in the selection and education of future students.

The 1961 survey of African students (24) revealed a great disparity in the amount of advance information about the United States received by the students. Of the 99 percent responding, 13 percent had much information, 41 percent had some information, 31 percent had little information, and 14 percent had no information. Does the amount of advance information about the United States available to a Nigerian student bear any relationship to his academic achievement? Are well-planned and formal orientation programs such as carried out by the United States Agency for International Development necessary? Do the results realized from such programs justify the investment in money, time and labor? This is certainly another area for investigation.

Wolins (46) found that by making his statistical analysis separately on students in each college at Iowa State University he had better results on prediction of freshmen grades than did previous researchers. It is suggested that studies be made separately on the academic achievement of Nigerian students in various subject-matter areas; agriculture, engineering and social science; to name a few. Such studies could also classify higher educational institutions in order to eliminate any bias caused by suspected differences.

Most governments in the smaller and developing countries of the world usually have their long-term economic development plans. Generally, these plans call for the training of individuals for specific jobs. Therefore, scholarships are awarded to fulfill some of these needs. The various agencies of the Federal Republic of Nigeria award about 500 scholarships per year. Should scholarship recipients be allowed to change

their majors. What conditions should justify the granting of permission to change? What inducements are necessary to attract graduates back to Nigeria? What guarantees are necessary to protect long-term development programs? There is a definite need for research in this area.

There is also a basic need for investigation of the social conditions pertaining to the academic achievement of Nigerian students in the United States. What are the effects of discrimination on achievement? Do the social problems of the students change with length of stay in the United States?

Finally, there are obviously many other problems that call for study. Among them are: comparison of academic achievement of African and American students for better counseling and placement purposes, and studies on the adaptation of the curriculum to African students.

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APPENDIX

Questionnaires

Information on the Academic Achievement of Nigerian Students (form sent students)

1. Date:_____ 2. Age:_____ 3. State in U.S._____

4. What was your grade in the school certificate examination?
   1_____ 2_____ 3_____ Failed_____ Did not take_____

5. What was your grade in English language?
   A_____ C_____ P_____ PF_____ F_____

6. What was your grade in Elementary Mathematics?
   A_____ C_____ P_____ F_____

7. How many subjects did you pass in the GCE ordinary level?
   3_____ 4_____ 5_____ 6_____ More than 6_____

8. Did you earn a Teacher's Grade II Certificate? Yes_____ No_____

9. Did you attend a post-secondary institution in Nigeria for
   year(s) _____ 1_____ 2_____ 3_____ 4_____ 5_____ More than 5_____

10. When did you arrive in the U.S.? _____ _____
    month year

11. What is your present major field of study? _____

12. What is your academic classification?
    Freshman_____ Sophomore_____ Junior_____ Senior_____
    Graduate_____ Special_____ Other; specify_____

13. Who was your original financial sponsor?
    A Nigerian_____ USAID_____ ASPAU_____ GOVT_____
    Other; specify_____

14. Who is your present financial sponsor? _____

15. What was your grade-point average at the end of your
    first term (quarter or semester)? _____
    4.00

16. What was your cumulative grade-point average at the end of the
    first term of your second year in residence? _____
    4.00

17. What is your cumulative grade-point average now?_____
    4.00

18. If you are a graduate student, where did you obtain your first
    degree?_____ When?_____

Information on the Academic Achievement of Nigerian Students (form sent faculty advisors)

1. State in the U.S._____ 2. College or University

_____ 3. Title on Staff_____

4. How many Nigerian students do you now have as advisees?

Undergraduates_____ Graduates_____

5. On a scale in which 4.00 represents a perfect score, what is the cumulative grade-point average of your Nigerian advisee above.

Undergraduate_____

Graduate_____

Letters of Contact

Department of Mathematics
Iowa State University
218 Beardshear Hall
Ames, Iowa 50010
May 7, 1967

Dear Academic Adviser:

My name is Romanus Ohuche. I am a citizen of Nigeria and at present a graduate student in education and a graduate assistant in the Department of Mathematics at Iowa State University.

Recently, I started a doctoral study entitled "Scholastic Factors pertaining to the Academic Achievement of Nigerian Students in the United States". Some of your advisees are in my sample. Could you please complete this small questionnaire and mail it to me in the stamped and addressed envelope? Thank you.

Sincerely yours

Romanus O. Ohuche

Student Name:_____

Department of Mathematics
Iowa State University
218 Beardshear Hall
Ames, Iowa 50010
May 7, 1967

Dear Nigerian Student:

My name is Romanus Ohuche. I am a citizen of Nigeria and presently a graduate student at Iowa State University.

Recently, I started a research project for a doctoral dissertation. The title of the study is "Scholastic Factors pertaining to the Academic Achievement of Nigerian Students in the United States". My hope is that the findings of the study can be used to make the educational experiences of Nigerian students in the United States more meaningful.

You are one of the students in my sample. Therefore, I am asking you to complete this short but very valuable questionnaire and mail back to me in the stamped and addressed envelope. Please do this today. Observe that the questionnaire does not include any method of identification. So, please feel free to supply any information that may contribute to the value of this study.

Sincerely yours,

R. O. Ohuche

Data

Table 17. College or university cumulative grade-point averages of Nigerian students in the sample

Numerical identification	Undergraduates	Graduate students	Numerical identification	Undergraduates	Graduate students
1	3.92	4.00	31	3.24	3.50
2	3.80	3.95	32	3.20	3.50
3	3.75	3.92	33	3.20	3.50
4	3.67	3.90	34	3.15	3.50
5	3.66	3.86	35	3.12	3.43
6	3.65	3.85	36	3.10	3.43
7	3.63	3.84	37	3.10	3.40
8	3.63	3.83	38	3.10	3.40
9	3.58	3.76	39	3.10	3.40
10	3.50	3.75	40	3.10	3.40
11	3.50	3.75	41	3.09	3.39
12	3.50	3.75	42	3.04	3.35
13	3.50	3.70	43	3.00	3.29
14	3.48	3.67	44	3.00	3.27
15	3.47	3.63	45	3.00	3.25
16	3.42	3.60	46	3.00	3.25
17	3.40	3.60	47	3.00	3.25
18	3.40	3.60	48	3.00	3.20
19	3.40	3.60	49	3.00	3.20
20	3.37	3.60	50	3.00	3.20
21	3.33	3.60	51	3.00	3.14
22	3.30	3.60	52	2.97	3.13
23	3.30	3.58	53	2.95	3.10
24	3.30	3.50	54	2.95	3.10
25	3.30	3.50	55	2.95	3.04
26	3.30	3.50	56	2.94	3.00
27	3.30	3.50	57	2.94	3.00
28	3.25	3.50	58	2.90	3.00
29	3.25	3.50	59	2.90	3.00
30	3.25	3.50	60	2.88	3.00

Table 17. (Continued)

Numerical identification	Undergraduates	Graduate students	Numerical identification	Undergraduates	Graduate students
61	2.87	3.00	91	2.30	
62	2.85	3.00	92	2.30	
63	2.85	3.00	93	2.25	
64	2.84	2.90	94	2.20	
65	2.82	2.60	95	2.20	
66	2.80		96	2.20	
67	2.80		97	2.08	
68	2.80		98	2.00	
69	2.80		99	2.00	
70	2.78		100	2.00	
71	2.76		101	1.90	
72	2.75		102	1.80	
73	2.70		103	1.79	
74	2.70		104	1.50	
75	2.65				
76	2.63				
77	2.60				
78	2.58				
79	2.55				
80	2.54				
81	2.50				
82	2.50				
83	2.50				
84	2.50				
85	2.50				
86	2.40				
87	2.40				
88	2.40				
89	2.40				
90	2.38				

68

971